

Appendix K

Air Sampling Report

**SUSPECTED SOURCE AREA
INDOOR AIR CONTAMINATION
INVESTIGATION REPORT
FOR
NEWMARK RI/FS GROUNDWATER
CONTAMINATION PROJECT**

Prepared for:

**Contract No. 68-W9-0054 / WA No. 54-10-9LJ5
U.S. Environmental Protection Agency
Region IX
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1 INTRODUCTION

2 URS Consultants, Inc. (URS), concurrent with other Newmark Remedial Investigation/Feasibility Study
3 (RI/FS) Groundwater Contamination Project (Newmark) field activities underway in the project study area,
4 conducted a preliminary screening-level investigation in the homes of participating residents in the
5 northwestern region of the city of San Bernardino. The objective of the investigation was to evaluate
6 whether significant levels of trichloroethylene (TCE) and tetrachloroethylene (also known as
7 perchloroethylene [PCE]), the volatile groundwater contaminants of concern, were present in the indoor air
8 of residents living within or overlying an area suspected as a potential source of groundwater contamination.

9 Based upon the results of a large 1987 joint California Air Resources Board (CARB) and U.S.
10 Environmental Protection Agency (EPA) exposure assessment study for toxic air pollutants (Pellizzari,
11 et al. 1989), average concentrations of TCE and PCE in indoor residential air are expected to be within a
12 range of 0.15 to 0.82 parts per billion by volume (ppbv) for TCE and 0.21 to 1.00 ppbv for PCE.
13 Additional details of the 1987 CARB/EPA study are provided in the following section.

14 Preliminary analytical data gathered during the installation of project monitor wells (MW02A,B; MW03A,B)
15 in the suspected source area, the former site of the San Bernardino Airport (Airport), indicated the presence
16 of detectable levels of TCE and PCE in the groundwater but not in the underlying soils. The preliminary
17 data suggest that while the suspected source area may have contributed to the groundwater contamination,
18 there is no residual contamination present in the soils at detectable levels. The principal source or sources
19 may be further upgradient.

20 Nevertheless, the EPA, in an effort to be responsive to the residents' concerns, authorized URS to initiate
21 the investigation and prepare an Indoor Air Sample Plan. The sampling procedures and protocols presented
22 in the Air Sample Plan were based on those specified in EPA Method TO-14 and the Draft Statement of
23 Work (SOW) for sampling and analysis of volatile organic compounds (VOCs) in ambient air (EPA 1988;
24 1991). The final Air Sample Plan was submitted as Appendix C to Sample Plan Revision 1, dated 05/08/92
25 to Mr. Kevin Mayer, EPA Region IX Remedial Project Manager (RPM) for Newmark. Indoor air sampling

activities were conducted from 05/13/92 through 05/15/92. A total of six samples were shipped to the analytical laboratory on 05/15/92 and analyzed on 05/20/92.

BACKGROUND

A number of municipal water supply wells in the city of San Bernardino are contaminated with chlorinated solvents. The contaminants of concern, TCE and PCE, were detected at concentrations exceeding federal and state action levels for public drinking water supplies. A principal source of the contamination is believed to be a result of uncontrolled discharges and other activities at the site of the former Airport. A review of documents, photographs, and interviews with residents and former employees indicated that activities at the Airport, before and after its closure, included the use, storage, and probable uncontrolled release of solvents and other liquid wastes. Following closure of the Airport in 1958 until about 1972, a trench located near the former runway may have been the site of surreptitious dumping of a variety of wastes, including septic tank pumpings which commonly contained chlorinated solvents. In addition, the hangar and shop areas were used by a heavy machinery repair operation. The operation was known to have used a deep pit, known as the "Cat pit", as a sump for various liquid wastes that probably included waste oil, hydraulic fluids, coolants, and solvents used as degreasers to clean the machinery and equipment.

Much of the area of the former Airport site has been subject to fairly extensive residential development in recent years. Residences, principally condominiums, have been constructed adjacent to and, in some instances, overlying the area of the former Cat pit and disposal trench. The residents, aware of the ongoing RI/FS and the history of the suspected source area, have expressed concern over the possibility of gaseous TCE and PCE emissions from the contaminated subsurface entering their homes and posing a potential health hazard.

The contaminants of concern, TCE and PCE, are highly volatile chlorinated solvents commonly detected at low concentrations (i.e., < 1 ppb) in the indoor air of homes and public buildings in California. The principal source of indoor TCE and PCE emissions are consumer products used in most homes, which include household cleaners, adhesives, cosmetics, fabrics, water repellents, building materials, dry cleaning

solutions, brake quieters/cleaners, film, and a variety of other products. Some products contain as much as 90 percent TCE or PCE by weight (CARB 1990; 1991).

Emissions from contaminated point or area sources can also contribute to elevated indoor concentrations. VOCs, such as TCE and PCE, could volatilize from a contaminated subsurface source, migrate up into the ambient air, and then into the indoor air through open windows or doors (convective flux) and, to a lesser extent, through the concrete foundations and walls (diffusive flux). The extent and importance of the contribution of a subsurface source is greatly dependent upon source strength, depth to groundwater, soil porosity, soil organic carbon fraction, structural and design factors, air-exchange rate, and a variety of other chemical and physical parameters.

Based on the results of the 1987 CARB/EPA study conducted in 51 Los Angeles community households, average residential indoor TCE concentrations can be expected to range from 0.15 to 0.82 ppbv (0.79-4.39 $\mu\text{g}/\text{m}^3$), and average indoor PCE concentrations can be expected to range from 0.21 to 1.00 ppbv (1.42-6.79 $\mu\text{g}/\text{m}^3$) (Pellizzari, et al. 1989). Concentrations will vary among residences due to the differences in the numbers and types of emission sources in use and the air turnover rate (i.e., ventilation) in individual homes.

The results of CARB sampling data indicate that indoor air concentrations of TCE and PCE are consistently higher than outdoor concentrations. Based upon ambient monitoring data collected at 19 CARB monitoring stations throughout California, basin-wide mean outdoor concentrations range from 0.14 (South Central Coast) to 0.26 ppbv (San Francisco Bay Area) for TCE (CARB 1990), and 0.15 (San Joaquin Valley Air Basin) to 0.43 ppbv (South Coast Air Basin) for PCE (CARB 1991). The estimated mean statewide population-weighted exposure for approximately 20 million Californians is 0.22 ppbv for TCE and 0.37 ppbv for PCE (CARB 1990; 1991).

1 MATERIALS AND METHODS

2 Prior to the beginning of sampling activities, the EPA contacted residents within the project study area.
3 Four households agreed to participate in the investigation. Three of the residences were situated directly
4 over or adjacent to suspected source area sites (e.g., Cat pit and disposal trench). The fourth residence, a
5 neighboring home located upwind and immediately outside of the suspected source area, would serve as the
6 background location. Figure 1 depicts the locations of the four participating homes. Additional information
7 for each residence, as well as a summary of the analytical data, are presented in Table 1.

8 Sampling materials and methods employed during the course of the investigation followed those specified
9 in the Air Sample Plan, which was prepared in accordance with the methods and materials described in EPA
10 Method TO-14: The Determination of Volatile Organic Compounds (VOCs) in Ambient Air Using
11 SUMMA® Passivated Canister Sampling and Gas Chromatographic Analysis, and the Draft SOW
12 (EPA 1988; 1991).

13 The equipment and materials consisted of: six evacuated SUMMA®-passivated, or polished, stainless steel
14 canisters supplied by Environmental Analytical Service, Inc. (EAS), the laboratory providing analytical
15 services and responsible for cleaning and checking the canisters in accordance with protocols specified in
16 EPA Method TO-14 (EPA 1988); one SUMMA® canister spiked by EAS with approximately 2 ppbv TCE
17 and PCE; six mass flow control regulators pre-set by EAS to collect an integrated 12-hour sample; one
18 pressure/vacuum gauge; one air pump to evacuate the test canister, if necessary; and two folding tables.

19 The flow control settings were checked by randomly selecting one of the six flow controllers pre-set by
20 EAS, and completing a 6-hour field check in accordance with EAS' Standard Operating Procedure (SOP).
21 The SOP is included in the EAS Analytical Report (EAS 1992) to be forwarded to the RPM in a separate
22 submittal. The field flow check assembly (flow controller and pressure gauge attached to a test evacuated
23 canister) indicated a change in vacuum pressure of 17" Hg over a period of six hours; exceeding the
24 recommended change ($10" \pm 3"$ Hg) by approximately 4" Hg. Although the flow setting would result in
25 reduced flow toward the end of the 12-hour sampling period, it was not considered a major concern
26 requiring resetting all flow controllers since a fairly constant flow would be maintained over enough of the
27 sampling period to ensure a reasonably integrated sample.

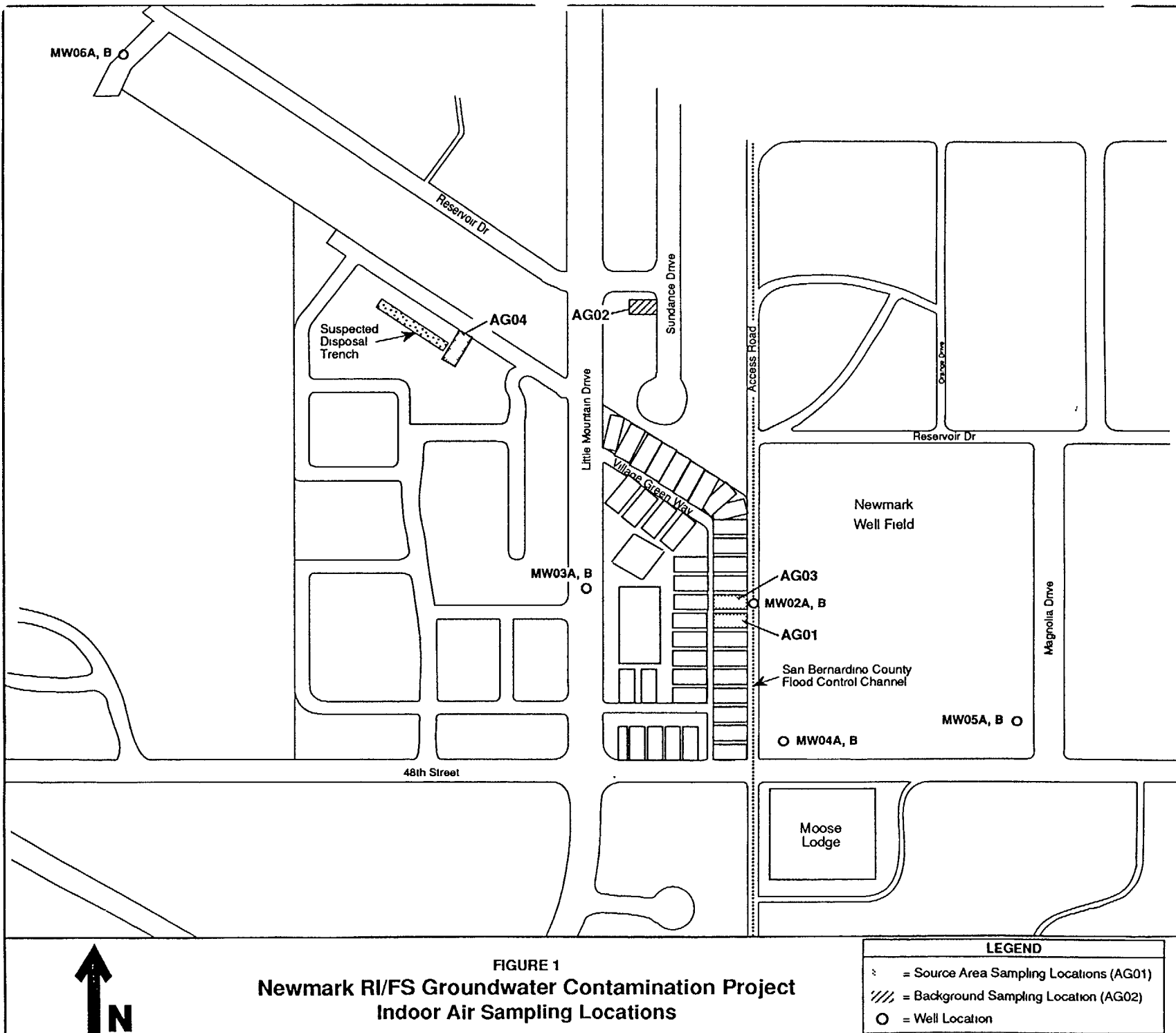


Table 1

NEWMARK RI/FS GROUNDWATER CONTAMINATION PROJECT
 INDOOR AIR SAMPLING SUMMARY

Site Designation/ Address	Sample No./ Type	Sampling Period	Results		
			TCE	PCE	Canister Pressure
AG01 4871 Village Green Way	AAG01-01 Source Area	Nighttime (1900-0700)	ND*	0.56 ppbv (3.8 µg/m³)	620 torr (83 kPa)
AG01 4871 Village Green Way	AAG01-02 Source Area Duplicate	Nighttime (1900-0700)	ND*	0.57 ppbv (3.9 µg/m³)	660 torr (88 kPa)
AG02 5088 Sundance Drive	AAG02-01 Background	Daytime (0715-1915)	0.25 ppbv (1.3 µg/m³)	0.33 ppbv (2.3 µg/m³)	626 torr (83 kPa)
AG03 4879 Village Green Way	AAG03-01 Source Area	Daytime (0730-1930)	0.32 ppbv (1.7 µg/m³)	0.59 ppbv (4.0 µg/m³)	643 torr (86 kPa)
AG04 1380 W. 48th St. Unit 113	AAG04-01 Source Area	Nighttime (1935-0735)	0.47 ppbv (2.5 µg/m³)	0.98 ppbv (6.6 µg/m³)	640 torr (85 kPa)
AG05 N/A	AAG05-01 Spike**	N/A	2.0 ppbv (11 µg/m³)	2.3 ppbv (15 µg/m³)	779 torr (104 kPa)

N/A = Not Applicable

ND = Not Detected

kPa = 10³ Pascal

* Method Detection Level = 0.20 ppbv

** Field

Sample collection systems (SUMMA® canister and flow controller) were assembled and set up on a folding table on the ground floor of each of the four participating residences. The sampling systems were positioned within the homes to ensure the collection of representative samples without obstructing family traffic patterns or being accessible to children or pets. The locations of the four residences are depicted in Figure 1 by site designation. Additional information is provided in Table 1 and in the following discussions.

■ **AG01.** Two sample collection systems, including one duplicate, were set up on a 28-inch high folding table in the center of a small room, or den, situated off the living room and adjacent to the kitchen. The den, located on the east side of the two-story house, has a window that overlooks and opens onto the San Bernardino flood control channel and recently installed project monitor wells (MW02A,B). The residence may have been constructed directly adjacent to the site of the former Cat pit. The resident was requested to leave the door open throughout the night and not to place recently dry-cleaned materials in the room. Two photographs were taken of the system and its position in the room. The valve of each canister was opened at 1900 hours and sampling was completed when the valves were closed at 0700 hours the following day, 05/14/92.

■ **AG02.** One sample collection system was placed on a folding table and positioned in the eastern half of the living room near the foyer. The single story home is located outside of the suspected source area and served as a background location for this investigation. The resident, a smoker, was requested not to smoke near the sample system and not to place any recently dry-cleaned materials in the room or near the canister. Two photographs were taken of the system and its position in the room. The canister valve was opened at 0715 hours and sampling was completed when the valve was closed twelve hours later at 1915 hours, 05/14/92.

■ **AG03.** One sample collection system was placed on a folding table and positioned in the southeast corner of the living room of this two-story house located next door to sampling site AG01. The living room, located on the east side of the two-story house, has a window that overlooks and opens onto the San Bernardino flood control channel and project monitor wells (MW02A,B). This residence, like site AG01, may also have been constructed adjacent

to the site of the former Cat pit. The resident was requested not to place recently dry-cleaned materials in the room or near the canister. Two photographs were taken of the system and its position in the room. The canister valve was opened at 0730 and sampling was completed when the valve was closed at 1930 hours, 05/14/92.

- **AG04.** One sample collection system and one canister spiked by EAS with known concentrations of TCE and PCE to serve as a field spike were placed on a folding table and positioned in the middle of the living room. The small townhouse may have been constructed over the site of the former disposal trench. The resident was requested not to place recently dry-cleaned materials in the room or near the collection system. Two photographs were taken of the system and its position in the room. The canister valve of the collection system was opened at 1935 hours and sampling was completed at 0735 hours the following day, 05/15/92. The spiked canister (Sample No. AAG05-01) remained unopened throughout the investigation.

At the completion of each sampling event the flow controller assembly was unscrewed and removed, the brass intake cap replaced on the top of the canister, the canisters labeled and returned to their original cardboard containers for temporary storage in the project field trailer, and the required documentation (e.g., Chain-of-Custody records, Sample logs, field notebook entries, photographic record) completed.

Seven canisters, including the one test canister not requiring analysis, were resealed in their original shipping containers and forwarded along with the Chain-of-Custody record to EAS by overnight mail (Federal Express) at 1710 hours, 05/15/92. A total of six samples or canisters, including one duplicate and one field spike, were submitted for analysis and received by EAS at 1430 hours, 05/18/92.

The samples were analyzed on 05/20/92 using EPA Method TO-14, which uses cryotrappping to pre-concentrate the samples for separation on a fused silica capillary column and analysis by full-scan Gas Chromatography/Mass Spectrometry (GC/MS). The GC/MS is tuned and operated in accordance with the specifications in EPA SW-846 Method 8240.

RESULTS AND DISCUSSION

The analytical results are summarized in Table 1. The data indicate TCE and PCE levels in the indoor air of residences located within the suspected source area are within the range of average residential concentrations found during the 1987 CARB/EPA study. However, background PCE concentrations, based upon concentrations detected at site AG02, were lower than those found at source area residences. Background TCE and PCE concentrations, 0.25 ppbv and 0.33 ppbv, respectively, were also in close agreement with CARB's estimated mean statewide population-weighted exposure levels for TCE (0.22 ppbv) and PCE (0.37 ppbv).

The PCE concentrations at the two adjacent residences (sites AG01 and AG03) were almost identical, and the TCE concentrations were either low (0.32 ppbv at site AG03) or not detected. The highest concentrations of TCE and PCE were detected at the residence suspected of overlying the disposal trench (site AG04). Although TCE levels were well within the CARB/EPA average range, the PCE levels were close to exceeding the range. All three source area residences exceeded CARB's estimated mean statewide population-weighted exposure level for PCE.

The collection of TCE and PCE in canisters was accomplished with little difficulty. The canisters were analyzed by GC/MS/Scan. The canister pressures of the samples were checked by the receiving laboratory, EAS, and were found to be at or above 83 kPa and did not require pressurization with zero grade nitrogen to ensure availability of sufficient sample. The laboratory reported that all laboratory quality control (QC) criteria were met for the six samples submitted for analysis. The method detection limit (MDL) was 0.20 ppbv for all environmental samples and 0.30 ppbv for the field spike (Sample No. AAG05-01).

The field QC sample data (duplicate, spike) appear to demonstrate reasonably good sampling method precision and accuracy. Precision, expressed as the relative percent difference (RPD), was calculated to be one percent for PCE; TCE was not detected in the duplicate pair (AAG01-01 and AAG01-02). Accuracy, measured as the percent recovery of a known concentration of approximately 2 ppbv for each analyte from the field spike (AG05-01), was 100 percent for TCE and 115 percent for PCE. The actual spike concentration is questionable. The laboratory had originally prepared the spike at a calculated level of

1 1.4 ppbv. The concentration was subsequently determined to be approximately 2 ppbv with about a 30 to 40
2 percent error factor.

3 REFERENCES

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